

Stakeholder Engagement Report: Public Health

Climate Change Preparedness in New Jersey

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Introduction

The New Jersey Climate Adaptation Alliance is developing a compendium of state and local public policy recommendations to enhance climate change preparedness in New Jersey. As part of that effort, the Alliance solicited insight and recommendations through various methods to better understand how specific sectors in New Jersey perceive climate change impacts and how these sectors are prepared for the potential effects. The findings through this process will help the Alliance to identify specific policy changes that are needed within the public health sector so the sector can better prepare and respond to the public health needs that may develop as a result of a changing climate.

Background: Public Health in New Jersey

New Jersey's public health sector covers a broad range of needs and responsibilities, including from within the private, non-profit and government sectors. The government sector is characterized by a decentralized system. While the New Jersey Department of Health has general oversight on broad public health issues, public health agencies at the county and/or local level carry out primary responsibilities. There are 94 county and local health departments, each of varying sizes and levels of capacity, serving the state's 565 municipalities. Services typically provided by these local health departments include Investigation of communicable diseases, environmental health and sanitary code inspections, public health education, and emergency planning and response. Funding for these departments is heavily dependent on fees generated by inspections and licensure, and by local taxes.¹

Other state agencies that have roles in regulating or providing public health related services include the Department of Environmental Protection, The Department of Children and Families, the Department of Veterans Affairs and the Health Care Facilities Financing Authority. The New Jersey Department of Human Services (DHS) administers most health service programs for vulnerable populations, including the poor, elderly and disabled. Medical care for these populations is administered through the Division of Medical Assistance and Health Services. Mental health care is coordinated by DHS under the Division of Mental Health Services.²

Healthcare and treatment in New Jersey is provided through a range of acute and long-term care facilities, operated through the government, private and non-profit sectors, as well as numerous types of providers. Among these facilities and providers are hospitals, federally qualified health centers, nursing homes and assisted care facilities, home health and hospice agencies and local health departments³. Individual private medical practices in New Jersey typically have a small staff and operate independently. In addition to healthcare in general, the sector's concerns also include environmental health risks, including those from various sources and types of pollution.

Approach

This paper is intended to represent the views and opinions of various stakeholders in the public health sector. The process for researching this paper does not include an extensive or comprehensive literature review.

¹ New Jersey Climate Adaptation Alliance (NJCAA.) 2014. A Summary of Climate Change Impacts and Preparedness Opportunities for the Public Health Sector in New Jersey. New Brunswick, NJ. Rutgers University.

² See NJCAA, 2014

³ See NJCAA, 2014

In February 2013 a focus group was held with approximately 50 public health officials, members of the NJ Association of County and City Health Officials, in conjunction with their annual meeting. They identified a series of public health hazards and impacts associated with climate change, as well as a straw man list of the most pressing issues and needs.

An online survey of public health officers was conducted in April, 2013. A copy of this survey is found in Appendix A and a copy of a summary of the survey results is found in Appendix B. The survey, conducted between April 8 and April 22, 2013, elicited responses from 22 public health officers in New Jersey. Of the respondents, 36 percent work at health departments serving multiple municipalities, 14 percent work at county health departments and 14 percent work at regional health departments. Of the respondents, 87 percent are the lead public health officer in their health department, and 62 percent have served in their position for more than 10 years. All but one respondent reported that a member of their health department is routinely present at emergency planning and response meetings in the community.⁴

During the fall of 2013 and early in 2014, one-on-one interviews were conducted with targeted stakeholders and experts. Among the stakeholders interviewed were representatives from the New Jersey Hospital Association; New Jersey Primary Care Association; Health Care Association of New Jersey; LeadingAge, a not-for-profit senior care organization; The New Jersey chapter of the American Congress of Obstetricians and Gynecologists; the New Jersey chapter of the American Academy of Pediatrics; The New Jersey chapter of the American Academy of Family Practice; and the New Jersey chapter of the American College of Physicians, which represents internists.

Experts interviewed included a practicing occupational health physician from Robert Wood Johnson Medical Center, a risk analysis and public health expert from Rutgers University, a vector-borne illness expert from Rutgers University, an allergy expert from Rutgers University, toxic materials experts from Rutgers University, an epidemiologist from the Centers for Disease Control, and a program manager from the Environmental Protection Agency Region II office.

Perceptions of Climate Change Impacts

Climate change is not high on the list of concern for many public health stakeholders. Healthcare providers, such as physicians, tend to be more focused on the symptoms a patient presents, rather than the overreaching societal or environmental causes, such as extreme weather or changing climate conditions. Because many physicians and other providers know there are many factors at play when a patient presents symptoms, a macro epidemiological issue that does not have direct causation of acute illnesses is not going to be of significant focus. Rather, care givers usually focus on the expected cause, as well as those variables that are within either the provider's or patient's power to modify.

However, those providers and healthcare organizations that work within emergency management roles have begun forms of 'all hazards' planning, such as preparing for terrorist attacks, natural disasters and pandemics. This preparation, in effect, has helped parts of the sector prepare for some of the effects of climate change.

⁴ New Jersey Climate Adaptation Alliance (NJCAA). 2013. Surveys of Stakeholder Groups. Climate Change Preparedness in New Jersey. Edited by Raimy Cheyne. New Brunswick, New Jersey: Rutgers University.

Facilities

Prior to the terrorist attacks of September 11, 2001, hospitals were required by the state and federal governments to have emergency operations plans as a condition for receiving operating permits. However, those plans, in practice, rarely were examined, updated and, sometimes, were never fully complete. After 9-11, Federal and state initiatives required that hospitals revisit planning and training efforts. The New Jersey Department of Health and Senior Services (now the New Jersey Department of Health) and the New Jersey Department of Human Services invested in Medical Coordination Centers that acted as regional communication hubs during medical emergencies, provided regional and statewide training, and developed systems that could be used to voluntarily track medically vulnerable people. These initiatives encouraged, but did not require, facilities to reduce vulnerability to extreme weather and the associated medical surge of patients following man-made disasters. They also offered tools for local health departments to begin identifying populations most vulnerable to high impact environmental events in their communities. Preparedness requirements, until 2006, focused on chemical, biological, radioactive, nuclear and explosion-related disasters. Initiatives following Hurricane Katrina, along with the threat of a pandemic from H1N1 influenza, prompted the Federal government to reorient its training and preparedness activities under an “all hazards” umbrella and incorporate threats from natural disasters. In the health sector, most money was spent on planning and individual and group response training, as well as creating assets at the state level, including the Health Coordination Center within DOHSS. These investments have led to near real-time monitoring of available ambulances, emergency rooms, surgical suites and other acute services. It has also allowed the State to monitor the functional status of the many residential facilities that serve the elderly and/or disabled.

Planning has centered on responses to mass casualty events and a special focus on man-made disasters with natural disasters and pandemic response incorporated in 2006. However, internal organizational culture within the healthcare sector, organizational silos, and lack of resources for use on a longer time horizon have prevented some of these plans from being fully implemented. Healthcare organizations have asked the Federal Emergency Management Agency for capital improvement dollars, but minimal funding for future mitigation is available at this time.

Acute care

Hospitals, for the most part, have focused their planning on learning from past events and planning for future events, such as extreme weather and mass casualty events, rather than overall impacts of climate change on either their patient population or on their own organizational function and structure. Medical centers do conduct debriefing sessions after regional events, and thus have information on the responses of similar facilities in New Jersey and in much of the rest of the US.

In response to what was seen during Sandy, the New Jersey Department of Health (NJDOH) launched an initiative to create a Healthcare Coalition model. This model, which builds on the Medical Coordination Center model, is a collaborative effort that brings together all healthcare facilities in a defined region to plan for large scale emergency events. But the long term impact of these efforts is unclear as the effort is voluntary. While early participation has been robust, the question is whether that involvement will continue or whether the priority to continue this level of planning will lead to structural and functional changes in the organizations. Funding from the state solely is for discussing best practices and developing regional plans; the funding does not pay for resources.

The New Jersey Hospital Association has developed toolkits for its members to assess facilities for vulnerabilities, but whether a facility uses the toolkit depends on whether a particular facility perceives a need or gap as well as the choice of facility administration. While all acute care facilities have disaster plans, the completeness and functionality of the plans varies greatly by institution. There is no qualitative evaluation of the disaster plans or enforcement of training implementation.

Two hospitals in New Jersey were flooded during Sandy and there are others that are near or in 500 year floodplains. While these structures are built to withstand substantial storm events, changing conditions in the future, such as sea level rise, could put these facilities at a greater risk of flooding unless some form of mitigation is completed.

Residential & Chronic Care Facilities

The most substantial climate change vulnerability this sector has identified is extended power loss, which would affect care delivery, heating, air conditioning and communications. All aspects of this sector are equally vulnerable to extended power loss due to extreme weather. During Sandy, 15 nursing homes, serving 1,746 residents, lost power. Federally Qualified Health Centers had generators for subsistence, not maintaining operation. In general, chronic care and residential facilities have well-developed emergency preparation plans, including for evacuations

Ambulatory Care and Private Practice

The private practice subsector is characterized by small to medium practices, with small practices containing one to two doctors and medium practices containing three to 10 doctors. These practices have made some efforts to become more resilient in the face of power loss and water, but without further adaptation. Primary care physicians in New Jersey have a variable level of awareness of climate change impacts on their sector, both on the potential impact to patients as well as providing services. However, some physicians do not connect larger trends between climate change effects and day to day issues involving specific patients. Physicians said their focus tends to be addressing the symptoms presented rather than larger public health related root causes.

Professional physician organizations, including the New Jersey chapter of the American College of Physicians (NJACP), the New Jersey Academy of Family Practice (NJAFP), and the New Jersey chapter of the American College of Obstetricians and Gynecologists (NJACOG) do not have climate change on their scope of concern and have, instead, said during interviews that preparedness is up to individual practices. Many doctor's offices, particularly pediatric, family medicine, and gynecology practices, keep large quantities of vaccines and medications on site that must be refrigerated and plans must be in place to ensure that extended power losses do not destroy these materials. Many practitioners lost large amounts of perishable vaccine stocks after Irene and, especially, Sandy due to extended power outages. Those interviewed said there was no systematic identification of this vulnerability in New Jersey, despite the widespread occurrence following Katrina. There were no large scale methods to link individual private practices with other businesses and facilities that could maintain refrigeration. A few individual practices have created localized agreements with, for example, hospitals, or have installed generators to maintain the cold chain for vaccine.

Generators, however, are not a focal point. A stakeholder interviewed said an in-house survey of Federally Qualified Health Centers and other subsector non-profits found that a third of these organizations have generators to provide partial power to maintain refrigeration or sump pumps, but not enough power to open for business and provide service. Home healthcare providers note how their sector is affected by power loss and travel difficulties due to extreme weather. However, the impact on patients is not directly perceived from a health point of view unless there is sustained power loss or flooding of their buildings. Providers interviewed said that while the state-facilitated planning process following Sandy may bring together subsector members, there is no money available for potentially costly capital improvements.

Specific clinical impacts on patients with particular vulnerabilities have been discussed in detail, especially among those internists who see patients with reactive airway diseases. However, both the state and national chapters of primary care provider professional organizations have focused on the generic issue of preparedness for emergencies, rather than adaptations to climate change as a specified risk.

Public Health Officers

Responding to an online survey, 22 public health officers ranked climate change impacts as third most important, when presented with a list of five public health challenges. Challenges ranked ahead of climate change were communicable diseases and senior services for aging populations. The biggest challenge to achieve climate change preparedness, survey respondents said, was lack of funding, followed by lack of staff resources. Public health officers also said other barriers to climate change preparedness included a lack of regional coordination, statewide leadership and a pattern of prioritizing short-term needs over long-term planning.

Additional survey results:

- **Heat and drought impacts:** 82 percent of the respondents said they had great or some concern about increases in heat stress and stroke, 73 percent said they were concerned about decreased water supply, and 59 percent said they were concerned about food scarcity.
- **Air Quality impacts:** 95 percent of respondents said they were concerned about an increase in the number of cases and the severity of respiratory diseases, with 48 percent saying their concern was “great”.
- **Infectious disease impacts:** 86 percent said they had great or some concern about increases in vector borne diseases; 86 percent said they were concerned about increases in food or water-borne diseases and 90 percent said they were concerned about newly emerging diseases.

Other impacts: 90 percent of respondents said increases in mold and mildew were a concern and 67 percent said they had at least some concern about drinking water contamination.

All public health officers surveyed said extreme weather impacts to public health were of concern. Specific concerns included 100 percent of respondents saying ensuring food safety during power outages was of at least some concern, 95 percent of respondents said they were concerned about interrupted care for vulnerable populations and 90 percent said they were concerned about an increased need for sheltering. Public health officers also said they were concerned about extreme

weather impacts on their own staff, with 86 percent worrying about the strain and stress on responders⁵.

Public health officers, in the focus group, also raised concern that disbursement of capital funding is at the discretion of a disinterested municipal power. The public health officers suggested that funds be managed by an interested party that is informed about the needs of the public health sector.

Lessons from Sandy

Hurricanes Irene and Sandy gave the public health sector two major opportunities to learn about vulnerabilities to extreme weather and extended power losses. During Sandy, Jersey City Hospital's emergency department was flooded and the Palisades Medical Center in North Bergen had to evacuate over 80 patients due to a combination of power loss and flooding. Power losses to other healthcare facilities occurred statewide and other healthcare facilities, including private practices, suffered flooding. Lessons learned from previous events helped other healthcare organizations respond to Sandy. For those facilities that evacuated during Sandy, the decision to do so was arrived at earlier during the event compared to previous events and relocation facilities had been identified prior to the event. However, while hospitals are required by the State of New Jersey to have evacuation plans, these plans generally are not assessed for functional completeness and functional completeness varies by county.

Following Irene, a representative of the New Jersey Primary Care Association (NJPCA) said some physician's offices assessed their potential power loss scenarios and made contacts with affiliated organizations on power outage contingency plans. During preparation for Sandy, these practices moved their vaccines that needed refrigeration to affiliated hospitals that had generator power. Planning was ongoing at the time that Sandy hit, including some providers making plans as the storm was starting to affect the state. The NJPCA after Sandy is working to make sure these contingency plans are solidified and affiliations are strengthened.

Following Sandy, the NJDOH hospital preparedness program that was established after 9-11 is being adapted into the NJDOH sponsored regional Healthcare Coalitions. Provisions governing this program require preparations to be "all hazards."

Emergency Management and Response

Emergency management and response during extreme weather events is of great concern for many in the public health community and this is a key focus in terms of preparations. However, these preparations are not necessarily being made specifically with climate change in mind, except in isolated areas.

Priority issues identified by public health officers include: surge capacity (i.e., ability to handle increased numbers of people needing attention) and resources for local-level public health officers during emergencies; disruption in medical care for vulnerable populations due to lack of access to medicine or medical devices; limited mobility populations living in flood-prone areas; displaced populations suffering from short-or long-term distress; access to food, clothing and shelter following an extreme weather event; injuries from storms; creating more effective sheltering systems for vulnerable populations and the concern about disease spreading in shelters.

⁵ New Jersey Climate Adaptation Alliance (NJCAA). 2013. Surveys of Stakeholder Groups. Climate Change Preparedness in New Jersey. Edited by Raimy Cheyne. New Brunswick, New Jersey: Rutgers University.

Additionally, increasing and improving communication infrastructure was identified as a key pressing issue for protecting public health to the impacts of climate change.

Changes in Illness and Disease Risks

The effects of climate change could cause changes in prevalence, severity or type of disease and illness, including increasing cases of heat stress, changes in respiratory diseases, emerging pathogens, illness from food and water-borne pathogens and vector-borne diseases.

Vector-Borne Disease

Human vector-borne diseases, such as malaria and yellow fever historically were widespread in the Mid-Atlantic, including New Jersey. The diseases were all but eradicated in the 20th century due to extensive draining of wetlands and a shift to modern housing conditions where screens limited contact between mosquitos and humans. Since then, mosquito nuisance control has been well managed in New Jersey.

However, recently there has been an increase in human cases of various vector-borne diseases where birds or mammals, including humans, are accidental hosts. These diseases include West Nile virus, Lyme disease, and Eastern equine encephalitis. Vectors for some of these diseases include urban mosquitos, which thrive in backyards outside municipal or state jurisdiction. Control measures often are reactive, such as targeted spraying of adult mosquitos once human cases are identified. However, this often has little effect on disease transmission or spread.

Because vector-borne disease transmission primarily depends on the availability of vectors and infected hosts, human-only diseases such as malaria, dengue fever or yellow fever are often controlled by quarantining or maintaining infected people indoors. Therefore, climate change may have relatively little effect on the prevalence of these diseases. However, zoonotic vector diseases, whose primary hosts are wild birds and mammals, could increase in prevalence. This increase may be due to warmer air temperatures speeding up development rates of the pathogen in the mosquito. This may lead to higher infection and transmission rates for humans, vectors and primary hosts. Outdoor workers and those who spend time outside face the highest risk of infection.

A medical entomologist interviewed said climate change impacts on vector-borne diseases will vary depending on the specific vector and the type of conditions in which each species thrives. Other variables such as the primary host and the size of local wildlife populations also contribute to changes in specific vector-borne disease rates, so scientists are hesitant to directly link climate change with incidence rates. Changes in water resources, such as sea level rise or shifts in rain patterns, will likely interfere with established mosquito control practices and could result in increases in the mosquito populations that traditionally have been well-managed. Climate change can also affect the likelihood that exotic dangerous vector species might become established, which could increase new or local disease transmission to humans.

For example, the invasive Asian tiger mosquito thrives under hot and humid conditions, but is limited by hot and dry conditions. The Asian tiger became established in the U.S. in 1985 and has since spread to most Eastern states where it has become the dominant urban and suburban species. This mosquito is the primary vector of chikungunya fever, a disease that has been at epidemic levels of incidence since 2006 in the Indian Ocean basin and was discovered in the Caribbean for the first time in December, 2013. Since then, over 10,000 human cases have occurred.

Although local transmission of dengue or chikungunya fevers have yet to be reported in New Jersey, imported cases of both are observed, with infected patients arriving via airplane. A stakeholder said the occurrence of locally transmitted dengue or chikungunya in New Jersey is not a matter of “if,” but of “when” and warmer summers especially with increased precipitation could be strong contributors.

How climate change could affect tick-borne diseases, specifically Lyme disease, remains to be seen. Up to 70 percent of the deer ticks in Monmouth County, for example, carry the bacteria. Warmer temperatures could increase the rate of reproduction for deer ticks, however scientists say the deer population explosion due to habitat changes is a major contributor to the deer tick population boom. Other emerging diseases carried by deer ticks and other species of ticks found in New Jersey include babesiosis, which is a parasite that causes an illness similar to malaria, and Powassan, which is a virus that can cause encephalitis.

One area of concern public health officers expressed was the potential increase in pest populations due to climate change that would result in increased use of and, hence, human exposure to pesticides. They warned that better communication to the public with applying pesticide treatments is needed.

Other Disease and Acute Illness Risks

Public health officers and physicians said they had the following concerns regarding climate change effects on illnesses and disease risks:

- Acute mental stress from displacement due to extreme weather⁶
- Long-term or chronic mental stress due to displacement due to extreme weather
- Increased prevalence of heat illnesses due to extended heat waves
- Increased rates of respiratory illnesses due to increased air pollution during heat waves
- Increased mold exposure, both in homes and workplaces
- Increases in cases of allergies due to changes in pollen seasons and pollen potency

Increased cases of heat stress are of particular concern for workers who must wear heavy equipment or can't change their schedules to avoid the heat of the day.

Environmental Health and Exposure

Air Quality

Climate change could increase the amount of air pollutants that affect human health, including particulate matter and ozone. This increase would be due to more high heat days. Of the public health officers that responded to the survey, 95 percent said air quality effects on human health were of at least some concern.

Allergies

One stakeholder said that research models predict there will be changes in distribution, onset, duration and end dates for multiple types of pollens, including trees, grasses and weeds, such as ragweed. Some plant species may also increase pollen production by 20 percent to 30 percent.

⁶ See: New Jersey Climate Adaptation Alliance (NJCAA). 2013. Stakeholder Engagement Report: Social Services. Climate Change Preparedness in New Jersey. Edited by Patricia Findley. New Brunswick, New Jersey: Rutgers University.

This is likely to lead to increased human exposure and increased incidence of allergic responses, including rhinitis, conjunctivitis, sinusitis and asthma. Sensitization also is increasing. The number of people who show sensitivity to certain allergens, such as trees, grasses and indoor allergens, via skin tests has doubled. However, sensitization to ragweed, already one of the most common allergens, has only increased by 5 percent to 10 percent. This stakeholder noted that rate of increase in national incidence of ragweed allergies has been determined by location, with southern states seeing very little increase and middle to northern states showing much higher increases in incidence. These changes were almost directly correlated with the number of frost-free days; in areas where the number of frost free days are decreasing, the rate of increase in allergy incidence is increasing. Overall allergy incidence throughout the country appears to be increasing for different allergic pollens.

Of the public health officers that responded to an online survey, 95 percent said they were concerned about an increase in the number of cases of allergies as well as an increase in the severity of those cases; 33 percent said they considered the increase in cases and severity of allergies to be of great concern.

Mold Exposure

Mold exposure also is likely to be a public health issue affected by climate change. Increasing heat and humidity, along with changes in precipitation patterns, could lead to roof and building leaks. This is in addition to potential flood effects. There are no set occupational health standards for mold, only recommendations. Exposure could be extensive for those who work in buildings where there is mold growth, especially if that growth is relatively hidden, such as under carpets or in ceiling tiles. Workers who do remediation are likely to wear protective equipment. While much of the exposure is medically classified as benign because the impacts have to do with sinus irritation, lung irritation or other allergic responses, there is a risk for those repeatedly exposed for further illness, such as respiratory fungal infections. Beyond workers, also of concern is the health risk to those living in mold-infested houses.

With no set standards, public health officers said they are hindered in their ability to enforce standards for mold remediation, protecting homeowners and renters from further mold exposure.

Toxics Exposure

New Jersey has the highest number of Superfund sites in the nation and some of these sites are located near or in floodplains. Additionally, some of New Jersey's urban areas have contaminated and unremediated brownfield sites near populated neighborhoods that are, often, home to low-to-moderate income residents. Climate change is expected to alter precipitation and coastal flooding patterns and, as such, there is concern that contamination from these sites, including contaminated sediment sequestered in estuaries and wetlands, could be shifted and pose a human health risk.

Many contaminants, such as PCBs and dioxin, chemically adhere to sediment and remain in the natural system in some form. River floods could dislodge the sediment and move contamination hotspots downstream and, potentially, deposit contaminated sediment in parks, neighborhoods and even houses. This type of shift has happened before, notably during Irene when sediment in the Passaic River was deposited on ball fields in Lyndhurst, and during Sandy, when sediment from the Passaic River was deposited in streets and homes in Newark. However, testing by the U.S. Environmental Protection Agency (U.S. EPA) found that the level of contamination in both events was below the threshold for human health impacts for normal to high exposure rates. There are no

clean-up standards in place for property owners who find sediment with low levels of contaminants on their property after a flood, only general recommendations at the state and federal level. Of the public health officers surveyed, 86 percent said they had at least some concern regarding the public health impacts of flooding that spread contaminated sediment and toxic materials.

Newly unsequestered contaminated sediment could cause temporary elevation in levels of PCBs and dioxin in seafood, such as fish and crabs. Consuming contaminated seafood is the most direct human health exposure to these chemicals. Fish consumption advisories, notably the most stringent “do not eat” advisory, are in place for waterways in or near the most contaminated areas. But there is concern that individuals, particularly low-to-moderate income residents who are subsistence fishers, do not pay attention to these advisories. Long-term, the sediments must be removed in order to solve the exposure risk. But there is question as to whether all contaminated sediments can be removed due to transport dynamics in rivers, estuaries and the risk of wetland sediment becoming unsequestered due to sea level rise. A stakeholder said that if state and local leaders and advocates understand the increased potential for shifts in toxic sediment hotspots due to repeated floods related to climate change, this could put pressure on state and local agencies to alter how they adopt, enact and enforce consumption advisories.

A stakeholder also noted that the further potential human exposure to contaminants due to climate change are more likely to affect low income residents, especially due to neighborhood proximity to legacy pollution, lack of education about awareness and enforcement for site remediation. This is an ongoing environmental justice issue affecting public health that could increase due to climate change.

Changes to how existing groundwater contamination plumes spread (resulting in human health exposure through potable water supplies) also could be an effect of climate change if there are dramatic changes in precipitation patterns. Precipitation patterns also could alter the concentration and prevalence of naturally occurring toxics, such as arsenic. Further study is needed on these potential effects and correlation to public health risks.

Stakeholder Perceptions of Sectoral Preparedness

At the state level, NJDOH has divisions that have conducted multiple types of emergency preparedness and pandemic planning. A strategic plan has been prepared outlining how local health departments can better coordinate in the case of emergencies, with a goal of integrating electronic networks of various providers and agencies across the state. The state’s Public Health and Environmental Laboratories provides an array of testing capabilities and assists with preparing for biological and chemical threats, ensuring drinking water quality is maintained, identifying infectious disease outbreaks and screening for diseases in conjunction with the state’s Communicable Disease Service, which works with local health departments to investigate outbreaks and provides technical support⁷.

Entities across the public health sector submit data to the state for reporting communicable diseases. The data collection is mandatory, but there is no mandate to use the data and it is difficult to obtain or share data across jurisdictions⁸.

⁷ New Jersey Climate Adaptation Alliance (NJCAA.) 2014. A Summary of Climate Change Impacts and Preparedness Opportunities for the Public Health Sector in New Jersey. New Brunswick, NJ. Rutgers University.

⁸ NJCAA, 2014,

National organizations, such as the National Institute of Environmental Health Services⁹ (NIEHS) and the American Public Health Association¹⁰ (APHA), have created consensus documents on the health impacts and health and public health interventions needed, respectively, but these have not been systematically used by either the provider or public health organizations in New Jersey.

Facilities

New Jersey's healthcare sectors embarked on a series of assessments and planning following the terrorist attacks on September 11, 2001 and the lessons learned following Hurricane Katrina in 2005. When Hurricanes Irene and Sandy hit New Jersey in 2011 and 2012, the sector already had in place plans for handling mass casualty and mass exposure events, as well as identifying vulnerable facilities and systems during and in the recovery phase of extreme weather events. This preparedness was not done in response specifically to the potential effects of climate change. However, this type of planning had the effect of adapting the sector to some of the effects of severe weather events and other potential short-term effects of climate change.

Planning efforts, however, continue to exceed implementation by facilities and practitioner's offices. The culture for many health care organizations is to develop a plan, but there's little initiative or incentive to enact the planning because of a lack of resources and competing short-term priorities.

Broad efforts are underway by all associations contacted to expand the post 9-11 and Katrina preparedness efforts to include severe weather events in New Jersey. However, climate change adaptation is not specifically included in this effort.

While hospitals and other acute care facilities have multiple types of planning efforts either underway or complete, training is almost exclusively related to surge capacity and maintaining effective facility function during a medical surge. There are federally driven mandates to do training exercises on a biannual basis, but county offices of emergency management and local health departments make decisions on how best to implement regional emergency preparedness training exercises. These entities will approach specific healthcare facilities for participation. The training is based on responses to incidents of a chemical, biological, radiological, nuclear or explosive nature, not necessarily related to natural disasters or weather-related emergencies. Additionally, the training exercises focus on delivering services, not maintaining the facility's own functionality during a disaster.

While individual healthcare organizations are able and ready to handle localized events, whether man-made or natural, regional events such as high-impact weather events, pose a greater challenge. Response and coordination decisions during these types of events need to be done at the local and regional/county level. Because such regional events will involve many health care organizations, with different levels of preparedness, training, and available resources, success of agreed upon responses will vary among different organizations. Further, when events effect broad areas, resources will not be available from other nearby areas to respond.

⁹ National Institute of Environmental Health Sciences. (2012) Health Impacts of Climate Change. Retrieved March 17, 2014, from www.niehs.nih.gov/research/programs/geh/climatechange/health_impacts/index.cfm.

¹⁰ American Public Health Association. (2011) Climate Change: Mastering the Public Health Role. A practical guidebook. Retrieved March 17, 2014, from www.apha.org/NR/rdonlyres/6B7B9486-E485-4473-8992-B42A73DF95BF/0/ClimateChgGuidebookApril11.pdf.

There has been no systematic assessment of ambulatory care providers regarding extreme weather preparedness and none of the professional organizations included in this report were participating in any state or local initiatives on climate change adaptation. There have been no efforts to coordinate information sharing and safety for individual providers.

One barrier to this type of preparedness is the individual nature of New Jersey's private care sector. Practices tend to be small to medium, with 10 or fewer providers per practice. This fractured nature, which mirrors the state's political culture of home rule, leaves each practice to make decisions for themselves, without resources or expert guidance.

The Home Care Association of New Jersey is directly involved with NJDOH initiatives to help healthcare organizations better able to respond to regional events, specifically the creation of the New Jersey Healthcare Preparedness Coalitions on a regional basis. While this initiative is not explicitly directed at climate change adaptation, it will have that effect, at least in the delivery of care.

Public Health Officers

Public health officers consulted for this report said they view climate change effects and extreme weather events as public health emergencies that demand proactive and coordinated planning, as well as systems that can be bolstered during events. Public health officers also reported they are not sufficiently included into emergency preparedness planning. But, by virtue of their mission, public health officers can offer significant contributions to development and execution of emergency preparedness plans. Public health officers said shelter identification, crisis plan development and building codes designed to promote resilience all are actions that have public health implications. But, public health officers said, they typically are not consulted during the development of these measures. Officers pointed to the expansion of responsibilities they incurred following Sandy as an example, noting there are no systems in place to provide back-up support to staff shelters, conduct restaurant and grocery store inspections or help manage mental health crisis services.

Public health officers who filled out the survey said the most common existing preparedness programs were surveillance for diseases and mosquito control. The public health officers also said in the survey that the most important programs that were not planned, but needed, were health impact analyses that included climate change risks and emergency preparedness plans that included climate change and local capacities. Only 6 percent of those that filled out the survey said their health department had a local climate adaptation plan in place, while 20 percent said a climate adaptation plan was planned.

A summary of key findings from the survey is provided in Table 1.

Table 1: Key Findings of New Jersey Public Health Officers climate adaptation programs.¹¹

Program Type	Program in place	Program planned	Not planned, but needed
Local climate adaptation plans	6%	20%	67%
Heat warning system	29%	18%	47%
Cooling centers	68%	11%	21%
Warming centers	63%	11%	26%
Home energy assistance program	29%	0%	71%
Population Vulnerability Assessments	11%	22%	67%
Risk maps	6%	19%	69%
Emergency preparedness plans that include climate change and local capacities	6%	18%	76%
Identification of vulnerable populations in emergency preparedness plans	32%	32%	36%
Local Utility Communication plans for use during power outages	39%	33%	28%
Crisis and Emergency Response Risk Communication	55%	22%	22%
Coordinated short-term sheltering plans	50%	22%	28%
Health Impact Assessment related to climate change impacts	13%	6%	81%
Surveillance for diseases	89%	11%	0%
Public awareness program on climate change impacts	6%	19%	69%
Stockpiling of supplies	18%	41%	29%
Mosquito control	84%	11%	5%
Extra capacity or resources for local health departments in emergencies	12%	29%	59%

Recommendations from Stakeholders

Recommendations from most stakeholders about how their sector should prepare for a changing climate focused on funding, resources, better communication, increasing planning, and education. In some parts of the sector, namely facilities and private care physicians, basic understanding of the impacts of climate change is needed. One physician interviewed said she was dependent on daily weather forecasts and did not understand larger seasonal weather patterns and how those could affect patient health. That type of education, she said, could be helpful to her practice and potentially sector-wide.

The Centers for Disease Control’s framework that helps public health agencies develop climate adaptation strategies should be embraced by New Jersey. The framework, known as Building Resilience Against Climate Effects (BRACE), incorporates a five-step process states should follow to prepare for the public health impacts caused by climate change. The steps are: Forecast climate impacts and assess vulnerabilities; Project the disease burden; Assess public health interventions;

¹¹ New Jersey Climate Adaptation Alliance (NJCAA). 2013. Surveys of Stakeholder Groups. Climate Change Preparedness in New Jersey. Edited by Raimy Cheyne. New Brunswick, New Jersey: Rutgers University.

Develop and implement a climate adaptation plan that addresses health impacts, gaps in critical public health functions and formulates a plan for improving adaptive capacity within the jurisdiction; evaluate adaptation efforts. The CDC has provided 16 states and 2 cities with funding to undertake this type of approach. Even if New Jersey does not receive funding, the state can participate through various mechanisms. The Minnesota Department of Health's implementation of BRACE has resulted in a website cited by stakeholders as an excellent model for public education and outreach that explains the various effects of climate change on the public health sector and has been recommended as an example of an activity NJDOH should undertake.

Statewide and regional public health agencies, counties or other entities should conduct comprehensive, mapping-based, assessments of public health vulnerabilities to climate change, including examining potential risks and hazards, such as heat islands and flood zones, and social vulnerabilities. These assessments should include current conditions and anticipated future scenarios.

Local public health agencies, municipalities or other entities should conduct a localized vulnerability assessment on the census block or neighborhood level to better identify specific needs and gaps within individual municipalities. A method in which to conduct this type of assessment could be through the Geospatial Emergency Management Support System (GEMSS) model, which identifies goals and uses indicators to measure progress. For example, a city could use thermal imaging to identify local heat island effects and then compare measures of social vulnerability to better target specific public health programs¹².

Public Health Officers

In a survey of public health officers, nearly all respondents said they needed more staff and more financial resources in response to the question "what does your department most need to prepare and be ready to respond to climate change impacts over the coming decade." Of the respondents, 59 percent said they needed extra capacity and resources for local health departments during emergencies, while 29 percent said additional capacity is already planned. Other suggestions included better leadership at the state level, reliable emergency power sources, more precise weather forecasting, improved regional shelter planning and stockpiling of supplies.

Respondents also said there were multiple types of activities that were needed, but not planned. Those activities include:

- Health Impact Assessment related to climate change impacts (81%)
- Emergency preparedness plans that incorporate climate change (76%)
- Home energy assistance programs (71%)
- Public awareness programs on climate change impacts (69%)
- Risk maps (69%)
- Local climate adaptation plans (67%)
- Vulnerability assessments/censuses of vulnerable populations (67%)
- Heat warning systems (47%).

¹² Houghton, A.N. Prudent, J.E. Scott, R. Wade and G. Luber. 2012. Climate change-related vulnerabilities and local environmental public health tracking through GEMSS: A web-based visualization tool. *Applied Geography* (33): 36-44.

Stakeholders interviewed also said funding needs to be available for healthcare organizations to conduct preparedness and mitigation activities.

Emergency Management

Emergency preparedness plans need to be updated to match capacity at the local level and also include vulnerable populations in emergency planning. During prior emergencies, vulnerability assessments were identified as a key tool in protecting public health and also as an area where more resources and manpower are needed to adequately conduct these assessments. Increased training availabilities as well as communicating appropriate data is crucial for the public health officers conducting assessments. Public health officers recommended that local emergency plans be further integrated with county emergency management plans.

Public health officer focus group participants also said improved coordination with respect to communicating information to the public after major storms also is needed. While first responders and volunteer organizations that helped deliver vital post-storm services made up for the lack of public surge capacity, better coordination among all groups is needed. Additional training also is needed for these volunteers regarding how best to work with vulnerable and special needs populations. For example, elderly residents might be slow to respond or simply not hear a volunteer who is making a home visit. Improved communication and transparency between utilities and Public health officers is needed to identify and better serve those without power. Workgroup participants also recommended that the power grid be made more resilient to storms through additional investments in infrastructure.

Public health officers also said improving communication and coordination between first responders and those managing shelters, including national, state and local non-profit organizations and volunteers, is needed to provide effective sheltering. Public health officers said it is important to help connect shelter inhabitants with family members living outside affected areas. Improved communication with all entities could provide shelter inhabitants opportunities to leave shelters sooner, resulting in a lower demand for services and potentially reducing mental stress caused by displacement. Also, there needs to be consistency or a uniform protocol in sheltering rules. For example, practices for sheltering people and live animals for an extended period of time needs further review and development of standards.

Public health officers, responding to the on-line survey, also said the following measures are needed:

- **Better regional transportation to help with evacuation (89%)**
- **Improved coordination between health departments and state resources (67%)**
- **Improved coordination between health departments and health and other sectors (68%)**
- **More resilient emergency communications infrastructure (68%)**
- **Regional sheltering plans (63%)**
- **Improved training and retention for local health departments (61%)**
- **Rapid response systems for extreme weather events (61%)**
- **Enhanced vector and disease surveillance systems and data (58%)**
- **Critical infrastructure assessments (58%)**
- **Updated regulations addressing infrastructure upgrades (58%)**
- **Provision of regional charging centers for electronic equipment (53%)**
- **Updated or new regulations and guidelines addressing emergency planning (53%)**

Changes in Illness and Disease Risks

Recommendations for ways healthcare workers can help mitigate occupational risk from the effects of high heat and other extreme weather include better education as well as changing their work patterns during periods of extreme weather.

Another response stakeholders provided include potential alternative work schedules for some industries during high heat events to ensure workers are not exposed to the heat of the day. One interviewee noted workers who have a higher risk from various types of exposure, including to heat and mold, may not mention concerns to supervisors because they fear losing their jobs.

Environmental Health

Developing additional standards for environmental health risks that are low on the radar for the public health sector is recommended by stakeholders.

In particular, development and enforcement of mold standards was identified by public health officers as a pressing public issue. Stakeholders said in interviews that mandated mold standards at the state and federal level are crucial. Current mold standards are only recommended, rather than required and that could mean some property owners and business operators do not have an incentive to remediate mold.

The potential for additional floods, both river and coastal, to spread contaminated sediment appears to be low on the radar for storm recovery programs and even enforcing agencies. While the level of contaminants discovered after Irene and Sandy was below human health concern thresholds, there is concern that this could be a public health risk in future events. This should be considered a policy gap that needs further study.

Insights from the Authors

Throughout the research and interviews for this paper, several themes became apparent to the authors, notably the lack of comprehensive understanding within the healthcare sector about how climate change effects could affect human health on either a day-to-day or a long term basis. Healthcare providers are not necessarily trained, or have the time to focus on the broader epidemiological issues when presented with symptoms. Healthcare providers also are more inclined to solely treat the symptoms presented because there are many potential factors on an individual basis that could be contributing to increases in some conditions, not just climate change effects. Additionally, the authors noted that there is a gap in understanding the potential public health implications involving the risk of increased exposure to legacy pollution due to extreme weather events.

Our observations and recommendations:

- New Jersey should embrace the BRACE process to develop a comprehensive climate adaptation strategy for the public health sector. Even if New Jersey does not receive CDC funding the State or its designated agents can participate in portions of the process, such as workgroups and webinars.
- State and regional public health stakeholders, including NJDOH, counties or other entities should conduct comprehensive public health vulnerability assessments that consider current and future conditions. These assessments should be mapping-based and should examine risks, hazards and social vulnerabilities.

- Local entities, such as county and municipal public health departments, should conduct localized vulnerability assessments, which can better identify specific needs and gaps within individual municipalities. These local assessments should be conducted on the census-block level. A suggested approach in which to conduct this assessment is the GEMSS model¹³.
- A Federal Emergency Management Agency report examining the structural failures during Sandy suggested that hospitals and other healthcare organizations, such as assisted living facilities and clinics, plan for a complete system failure during an extreme weather event. Planning for this would require major infrastructure changes, yet leave the organization better equipped to handle extreme weather and disaster events. The U.S. Department of Health and Human Services has proposed national emergency preparedness requirements for all Medicare and Medicaid providers and suppliers. These requirements, proposed in December, 2013, would require that providers plan for and enact changes to make facilities resilient to natural and man-made disasters. The proposed requirements include developing and implementing “all hazard” emergency preparedness plans that are reviewed and updated at least annually as well as risk assessments, alternative sources of energy and utilities, technology redundant patient records and tracking, comprehensive evacuation plans, a training and testing program that is updated and reviewed at least annually and various drills and exercises conducted frequently¹⁴.
- Preparedness efforts after 9-11 focused on having actual plans on which healthcare organizations were trained. Hurricane Katrina’s effect was to introduce the concept of all-hazards planning. Sandy illustrated that infrastructure needs to be hardened, but that can’t be done without a great deal of funding. While preparedness has improved organizationally, physical preparedness toward resilience has remained constant, and there is no evidence that healthcare organizations, when creating these plans, are examining the long-term impacts from climate change on the health of the populations they serve. Concurrent with the federal proposal should be a system of indicators in place to measure the health improvements or outcomes in the populations in these facilities.
- Local and county health departments have little authority over broader public health concerns unless there is specific leadership within a particular organization. Public health officers also are overwhelmed with legacy mandates so that they are not in a position to look forward to proactively plan for what they view as an emerging public health issue of climate change. Thus, unless there is specific leadership on this issue at the state level – a leadership that has so far focused solely on response – the large gap in understanding and addressing climate change effects on public health will remain.
- Increased stressors on physicians in New Jersey to meet the demands of insurance requirements and other bureaucratic measures mean providers have little time to contemplate these issues. New Jersey’s clinical culture tends to be that of small practices with very little staff and little incentive to work with larger, overreaching authorities. This

¹³ Houghton, A., N. Prudent, J.E. Scott, R. Wade. and G. Luber. 2012. Climate change-related vulnerabilities and local environmental public health tracking through GEMSS: A web-based visualization tool. *Applied Geography* (33): 36-44

¹⁴ "Medicaid Programs; Emergency Preparedness Requirements for Medicare and Medicaid Participating Providers and Suppliers; Proposed Rule." 78 Federal Register. Pg. 79082. Friday, December 27, 2013.

leads to a lack of resilience, especially at the smaller practice level. This also further exacerbates the lack of world view of public health issues among private practitioners.

- There is a significant gap in physician and practitioner awareness about the broader weather and climate connection and implications both for their practices and their patients. Understanding these effects could help them better prepare patients for extreme conditions, including vulnerable populations and occupationally exposed populations. Clinicians are likely to treat the proximate causes of a particular condition, rather than explore broader climate impacts on health. While this is perfectly understandable, it hinders the development of awareness of climate changes impact on health in a key thought leader group. Such awareness would almost certainly have a strong impact on others understanding of this issue.
- There are no large scale programs, initiatives or policies to link individual private practices with other businesses and facilities that could maintain refrigeration.
- Many vulnerable segments of the population do not necessarily have access to education about personal resiliency. Often, health providers are a point of entry for educating these vulnerable populations. A pilot study on approaches for improving personal resiliency via health providers could inform the best approaches to improving preparedness in these vulnerable populations.
- Further research is needed into how climate change and flooding could affect the spread of contaminated sediment and how low levels of certain contaminants can affect human health.
- Controlling mosquito species that thrive in urban and suburban areas is a significant challenge, particularly where these species are vectors for diseases that are anticipated to establish themselves with increases in temperature and moisture. Problem areas rarely are identified early on unless impacted residents request service from local health departments or mosquito control agencies. Broader measures in education within government and the private sector could help address threats from emerging vector-borne diseases.

Appendix A: Survey of Local Public Health Officers

Preparing for Climate Change Impacts in New Jersey: A Survey of Local Public Health Officers

Q1 Please read the following information and sign electronically in the box below, indicating your informed consent. Thank you for agreeing to participate in this online survey. This research is being conducted by Rutgers University, in conjunction with the New Jersey Climate Adaptation Alliance. All New Jersey Public Health Officers are being asked to participate. The purpose of the survey is to obtain data to assess New Jersey's most pressing public health concerns resulting from climate change, and to help to prioritize a set of program, planning and policy adaptations that are necessary to prepare for and mitigate public health impacts. There are no reasonable or discernible risks to your participation in this study. We are not asking for your name on the survey, and will only utilize information about your jurisdiction or service area in summary form to categorize or further explain important differences, for example, between impacts and needs of rural health departments versus more urban ones. If we are able to deduce your identity (e.g. by knowing the name of the Public Health Officer in a certain municipality), the research will be confidential. Confidential means that the research records will include some information about you and this information will be stored in such a manner that there is some linkage between your identity (as deduced but not specified) and the response in the research. The information collected about you includes your opinions about climate change risks, ratings of concern about climate change impacts and your assessment of the needs for various climate adaptation programs. Please note that we will keep this information confidential by not including your name in the data records, limiting access to the research data and keeping it in a secure location. The research team and the Institutional Review Board (a committee that reviews research studies in order to protect research participants) at Rutgers are the only parties that will be allowed to see the data, except as may be required by law. If a report of this study is published, or the results are presented at a professional conference, only group results will be stated. All study data will be kept for three years. The benefits of completing the survey are that you will contribute to further knowledge and insight about impacts to public health from climate change and help to inform the development and prioritization of resources needed to support new or expanded programs or policies to address these impacts. The survey should take about 10-15minutes to complete. Participation is completely voluntary and refusal to participate will result in no penalties. You may opt out of completion of the survey at any time while taking it. If you have questions related to the research, please contact Jeanne Herb, Associate Director of the Environmental Analysis and Communication group, 33 Livingston Ave., New Brunswick, NJ 08901, 848-932-2725, jherb@ejb.rutgers.edu. If you have questions about your rights as a research subject, you may contact the IRB Administrator at Rutgers University at:

Rutgers University
Institutional Review Board for the Protection of Human Subjects
and Sponsored Programs
3 Rutgers Plaza
New Brunswick, NJ08901-8559
Tel: 838 932 0150
Email: humansubjects@orsp.rutgers.edu

This informed consent form was approved by the Rutgers University Institutional Review Board for the Protection of Human Subjects on 3/12/13; approval of this form expires on 3/12/16.

I have read and understand the risks and benefits of this research and agree to participate by typing my initials in this box. _____

Q2 Name of Health Department:

Q3 Select One:

- County
- Municipal (one municipality)
- Municipal serving multiple municipalities
- Regional

Q4 Size of population of your service area:

- 5,000-15,000
- 15,000-25,000
- 25,000-50,000
- More than 50,000

Q5 How many non-administrative staff (environmental health specialists and/or direct patient/person contact staff) work in your service area?:

- 1-10
- 10-20
- More than 20

Q6 Type of Community:

- Rural
- Suburban
- Urban

Q7 Your position:

- Lead Public Health Officer
- Staff in Public Health Department
- Other _____

Q8 How long have you been in this position?

- 1-5 years
- 5-10 years
- More than 10 years

Q9 Are you or a member of your health department routinely present at emergency planning, response, and recovery meetings within your community?

- Yes
- No

Q11 Do you Strongly Agree, Agree, Disagree or Strongly Disagree with the following statements?

	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't Know
Global climate change is not occurring.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Global climate change is mostly caused by human activity.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Global climate change is a risk to New Jersey.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Global climate change is a risk to me, my family, and my friends.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The international scientific community understands the science behind global climate change.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I trust the scientific community to truthfully report their findings related to climate change.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Our state and local officials understand the implications of global	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

climate change for my region.					
The media I rely on communicate honestly with us about global climate change.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q12 Please rate how concerned you are about the following climate-change related impacts to PUBLIC HEALTH in your service area: HEAT AND DROUGHT IMPACTS:

	Great Concern	Some Concern	Little Concern	No Concern	Not applicable to my service area
Increases in heat stress and stroke	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Food scarcity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Decreased water supply	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q13 AIR QUALITY IMPACTS:

	Great Concern	Some Concern	Little Concern	No Concern	Not applicable to my service area
Increases in cases and severity of respiratory diseases from increased particulates, ozone, etc.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increase in cases and severity of allergies from longer and more potent pollen season.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q14 EXTREME WEATHER EVENT IMPACTS:

	Great Concern	Some Concern	Little Concern	No Concern	Not applicable to my service area
Rescues/strandings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Deaths from storm events	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Injuries from storm events	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Acute emotional distress	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Longer-term economic impacts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strain/stress on responders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Interrupted care for vulnerable populations (e.g. during evacuations)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Toxic contamination from flooding of hazardous or contaminated sites	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Extreme cold from power outages	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ensuring food safety during power outages	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increased need for sheltering	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Disease spread from sheltering	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q15 INFECTIOUS DISEASE:

	Great Concern	Some Concern	Little Concern	No Concern	Not applicable to my service area
Increases in vector borne diseases (e.g. mosquitoes, rodents)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increases in food and/or water borne diseases	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Emerging diseases (e.g. diseases that are newly appearing or rapidly increasing in incidence or geographic range)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q16 OTHER EXPOSURES:

	Great Concern	Some Concern	Little Concern	No Concern	Not applicable to my service area
Drinking water contamination (e.g. from salt water intrusion)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Increased molds and mildew	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q17 Was your service area impacted by Tropical Storm Irene (2011)?

- YES
- NO

Q18 If yes, in what ways was your service area affected by Tropical Storm Irene (check all that apply):

- Deaths
- Injuries caused by event or response
- Short-term stress
- Longer-term stress
- Minor property damage
- Major property damage
- Minor flooding
- Severe flooding
- Resident evacuation
- Nursing home/assisted living facility evacuation
- Road closures
- Other (describe) _____

Q19 Was your service area impacted by Hurricane Sandy (2012)?

- YES
- NO

Q20 If yes, in what ways was your service area affected by Hurricane Sandy?

- Deaths
- injuries caused by event or response
- Short term stress
- Longer term stress
- Minor property damage
- Major property damage
- Minor flooding
- Severe flooding
- Resident evacuation
- Nursing home/assisted living facility evacuation
- Road closures
- Other _____

Q21 Of the following climate change adaptations or preparedness activities, which are in place, planned or needed IN YOUR SERVICE AREA?

	In place	Planned	Not planned but needed	Not needed	Don't Know
Local climate adaptation plans	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Heat warning system	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cooling center	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Warming center	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Home energy assistance program (heating and cooling)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vulnerability assessments/census of vulnerable sub-populations	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Risk maps	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Emergency preparedness plans that incorporate climate change and local capacities	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Identification of vulnerable populations in emergency preparedness plans	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Local utility communication plans for use during power outages	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Crisis and emergency response risk communication	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Coordinated short-term sheltering plans	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Health impact assessment (e.g., multi-factor health assessment related to climate change impacts)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Surveillance for diseases	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Public awareness program on climate change impacts	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Stockpiling of supplies (fuel, food,	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

water, medicine)					
Mosquito control	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Extra capacity or resources for local health departments in emergencies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q22 What are the most important actions/programs needed at the REGIONAL, STATE OR FEDERAL level to support local health departments to prepare and respond to climate change impacts?

	High Need	Some Need	Little or No Need	Don't Know
Enhanced air monitoring data	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Enhanced vector and disease surveillance programs and data	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Enhanced weather forecasting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Improved climate and weather modeling capacity for local scale assessments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Critical infrastructure assessments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Improved coordination between health departments (mutual aid) and state resources	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Improved coordination between health and other sectors (planning, transportation, emergency planning)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strengthened training and retention for local health departments	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Rapid response	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

system for extreme weather events				
Resilient emergency communications infrastructure	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Provision of regional cooling and warming centers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Provision of regional charging centers (e.g. for electronic equipment)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Provision of regional shelters	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Better regional transportation options (ease of evacuation, etc.)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Assistance with stockpiling of supplies	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Updated or new regulations or guidelines addressing: heat action levels	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
food and water handling	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
disease reporting	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
emergency planning/sheltering	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
mold	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
infrastructure upgrades	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
floodplain management	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q23 What does your department **MOST NEED** to prepare and be ready to respond to climate change impacts over the coming decade?

Q24 What are the biggest challenges to achieving preparedness for climate change for local health departments?

Q25 Please rank climate change impacts in importance in relation to other public health challenges: (Drag and drop the five issues listed below with 1 being most important and 5 being least important)

- _____ Senior Services for Aging Populations
- _____ Climate Change Impacts
- _____ Communicable Diseases
- _____ Domestic and Community Violence
- _____ Infant and Child Health (nutrition, vaccines, lead exposure, etc.)

Appendix B: Summary of Public Health Officers Survey

Summary of Public Health Officers Survey: Preparing for Climate Change Impacts in New Jersey Conducted online April 8 – April 22, 2013

Overview of Participants

22 respondents completed this online survey. Of the respondents, 36% work at municipal health departments serving single municipalities, 36% work at a health department serving multiple municipalities, 14% work at county health departments, and 14% work at regional health departments. Fifty percent serve populations of 25,000-50,000, 41% serve populations of more than 50,000 and 9% serve populations of 15,000-25,000. 73% work in suburban communities, 23% in urban communities, and 1 respondent works in a rural community. 87% of respondents are the lead public health officer in their health department. 62% of respondents have served in their position for more than 10 years. All but one respondent reported that a member of their health department is routinely present at emergency planning and response meetings in the community.

Views on Climate Change

68% of respondents believe climate change is occurring, with 7 disagreeing and 8 strongly disagreeing with the statement “global climate change is not occurring”. 23% do not agree that climate change is occurring, and 10% responded “don’t know”. There is a wide range of opinion regarding whether climate change is mostly caused by human activity, with 50% agreeing that it is, 32% disagreeing, and 18% responding “don’t know”. The overwhelming majority (91%) feel climate change is a risk to New Jersey, and 77% think climate change is a personal risk to family and friends. 64% agree that the international scientific community understands the science behind climate change and 68% trust the scientific community to truthfully report their findings related to climate change. There is little trust in the media, with only 27% agreeing that the media communicate honestly about global climate change. Most public health officers have limited faith in state and local officials’ comprehension of climate issues, with 64% disagreeing or strongly disagreeing with the statement “our state and local officials understand the implications of global climate change for my region.”

Climate Change Impacts to Public Health

Of the heat and drought impacts presented in the survey, 82% of the respondents expressed great or some concern about increases in heat stress and stroke, 73% expressed concern about decreased water supply, and 59% expressed concern about food scarcity. Of the air quality impacts, 95% expressed concern about increased cases and severity of respiratory diseases (48% answered ‘great concern’), and 95% were also concerned about increases in cases and severity of allergies (33% answered ‘great concern’). Of the infectious disease impacts, 86% expressed great or some concern about increases in vector borne diseases. 86% also expressed concern about increases in food or water-borne disease, and 90% expressed concern about newly emerging diseases. Of other exposures, mold and mildew were a concern of 90% of respondents, with 62% reporting great concern and 29% reporting some concern. 67% expressed concern about drinking water contamination (33% great/33% some).

Extreme weather impacts were a nearly universal concern, with no respondents reporting that they had ‘no concern’ about any of the extreme weather impacts to public health that were presented in the survey. Ensuring food safety during power outages was a primary concern, with 100% of

respondents expressing concern about this issue (71% great concern/29% some concern). 95% expressed concern about interrupted care for vulnerable populations (57% great/ 38% some) and 90% expressed concern about an increased need for sheltering (67% great/24% some). Public health officers were also very concerned about the impacts of extreme weather events on their own staff, with 86% reporting some or great concern about strain and stress on responders. Other major concerns included extreme cold from power outages (90% overall - 48% great/43% some), toxic contamination from flooding of hazardous or contaminated sites (86% - 48%/38%), longer term economic impacts (86% - 57%/29%), and deaths from storm events (86% - 43%/43%).

There were a number of extreme weather impacts about which the majority of respondents expressed some but not great concern, including rescues/strandings (19% great, 67% some), injuries from storm events (43% great, 52% some), acute emotional distress (24% great, 62% some), and disease spread from sheltering (24% great, 62% some).

Impacts from Irene and Sandy

The service areas of 86% of the public health officers surveyed were impacted by Tropical Storm Irene in 2011, with common impacts including road closures (88%), short-term stress (88%), minor property damage (69%), severe and minor flooding (56% each), and resident evacuation (56%). Other impacts experienced in their service areas included major property damage (44%), injuries (38%), longer-term stress (38%), power outages, nursing home evacuations, and deaths (2 respondents).

95% of the respondents' service areas were affected by Hurricane Sandy in 2012, with large majorities reporting that residents in their service areas experienced short-term stress (89%), road closures (89%), and minor/major property damage (78%/56%). 67% reported general resident evacuation and 11% (2 respondents) reported nursing home/assisted living facility evacuation. Six respondents reported injuries in their service area and one reported a death.

Climate Change Adaptation and Preparedness Activities

The most commonly reported preparedness activities that are already in place include surveillance for diseases (89% in place, 11% planned), mosquito control (84% in place, 11% planned), cooling centers (68% in place, 11% planned), warming centers (63% in place, 11% planned), crisis and emergency response communications (56% in place, another 22% planned), short term sheltering plans (50% in place, 22% planned), and local utility communication plans for use during power outages (39% in place, 33% planned).

Major needs identified, as measured by percentage of respondents reporting that the activity is not planned but needed, include health impact assessments related to climate change impacts (81%), emergency preparedness plans that incorporate climate change (76%), home energy assistance programs (71%), public awareness programs on climate change impacts (69%), risk maps (69%), local climate adaptation plans (67%), vulnerability assessments/censuses of vulnerable populations (67%), and heat warning systems (47%). 59% identified a need for extra capacity/resources for local health departments in emergencies, while 29% reported that additional capacity is already planned.

Regional, State, and Federal Actions

Better regional transportation options for ease of evacuation was identified as the highest priority need from the local, state, or federal level, with 89% of respondents noting a high level of need in

this area. Improved coordination, both between health departments and state resources (67%) and between health and other sectors (68%) were also identified as major needs.

Other state, regional, or federal actions and programs identified as 'high need' include more resilient emergency communications infrastructure (68%), provision of regional shelters (63%), strengthened training and retention for local health departments (61%), rapid response systems for extreme weather events (61%), enhanced vector and disease surveillance programs and data (58%), critical infrastructure assessments (58%), updated regulations addressing infrastructure upgrades (58%), provision of regional charging centers for electronic equipment (53%), and updated or new regulations/guidelines addressing emergency planning (53%).

Programs that respondents identified that there was 'some need' for include enhanced air monitoring data, enhanced weather forecasting, improved climate and weather modeling capacity for local scale assessments, provision of regional cooling and warming centers, and updated mold and floodplain management regulations.

Critical Needs

When asked "what does your department most need to prepare and be ready to respond to climate change impacts over the coming decade", nearly all responses focused on the need for more staff and more financial resources. Other suggestions included better leadership at the state level, reliable emergency power sources, more precise weather forecasting, and regional shelter planning and stockpiling of supplies.

Challenges

Not surprisingly, the biggest challenges identified by local health departments to achieving preparedness for climate change were lack of funding and lack of staff resources. Other barriers identified included a lack of regional coordination and statewide leadership, and the tendency to prioritize short-term needs over long-term planning.

Issue Prioritization

When presented with a list of five public health challenges and asked to rank them in order of importance, with 1 being most important and 5 being least important, the overall rank order was: 1) Communicable Diseases; 2) Senior Services for Aging Populations; 3) Climate Change Impacts; 4) Infant and Child Health; and 5) Domestic and Community Violence.